General Medicine

A COMPARISON OF SEQUENTIAL ORGAN FAILURE (SOFA) & QUICK SOFA SCORES IN PREDICTING HOSPITAL MORTALITY IN CRITICALLY ILL PATIENTS IN A TERTIARY CARE CENTRE

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ABSTRACT
Background: To validate Q-SOFA for predicting In-hospital mortality in patients presenting with sepsis in an ICU setting and comparing it to SOFA (Sequential organ failure assessment) score. To compare the performance of the SOFA score and qSOFA scores for in-hospital mortality prediction among critically ill patients in an ICU setting in a tertiary care center. **Aims And Objectives:** To compare the performance of the SOFA score and qSOFA scores for in-hospital mortality prediction among critically ill patients in an ICU setting in a tertiary care center **Methodolgy:** This study was done in the Department of Medicine in Kurnool Medical College, Kurnool among patients with age > 18 years with suspected infection who were treated at the ICU of Government General Hospital. **Results:** In our study 2 scoring systems were used –QSOFA and SOFA– both of which are acceptable scoring systems in sepsis. Each of these scores was analyzed with mortality to determine which test predicted mortality better at discharge and at 28 days post-discharge follow-up. On comparing the SOFA score with mortality it was found that 81.82% of the patients who expired at discharge and 77.78 % of the patients who expired at 28 days post-discharge had a SOFA score more than 11(the median SOFA score). At discharge, the sensitivity along with the specificity of SOFA score was 81.8% and 97.4% respectively and at 28 days follow-up, the sensitivity, and specificity in predicting mortality were 77.78% and 100% respectively. On comparing Q-SOFA score with mortality it was found that 63.64% of the patients who expired at discharge and 77.78% of the patients who expired at 28 days post-discharge had a Q-SOFA score of more than 2. At discharge, the calculated sensitivity, as well as specificity of the Q-SOFA score, was 63.6% and 56.4% respectively and at 28 days post-discharge it was 77.78% and 66.7% respectively. AUROC was also calculated for the above-mentioned scoring systems in denoting its predictive power for mortality in sepsis patients. At both discharge and 28 days post-discharge follow-up, SOFA score was found better in predicting mortality followed by Q-SOFA score. Given that both SOFA and Q-SOFA have sensitivities close to each other for both In-hospital and 28-day mortality (81.8% vs. 63.6%) and (77.78% vs. 77.78%), the Q-SOFA could be used for rapid assessment before lab investigations are available for early goal-directed therapy, though SOFA is the most accurate score for predicting mortality **Conclusion:** 1. Sepsis scoring system Q-SOFA showed a sensitivity of 63.6 % at discharge and 70% at 28 days follow-up for predicting mortality in patients presenting with sepsis
2. Comparison of SOFA, Q-SOFA it was revealed that SOFA score predicted the mortality of sepsis the best both at discharge and at 28 days follow-up.

KEYWORDS :

INTRODUCTION
Definition of sepsis: It's a life-threatening illness complex marked by significant organ failure as a result of unbalanced host's response to infection. Sepsis-related mortality is still strongly linked to delayed or insufficient treatment. This is why modern clinical ideas were created in order to identify criteria for detecting sepsis quickly. Sepsis is defined as a suspected or verified infection along with two or more systemic inflammatory response syndrome (SIRS) criteria over the past 24 years.

However, clinical criteria that serve to characterize sepsis have changed in recent decades as a result of improved understanding of the underlying Pathobiology. In 2016 the Third International Consensus introduced definition for sepsis and septic shock (sepsis-3) that brought a significant change in diagnostic criteria of sepsis However, still, a highly sensitive and specific diagnostic test for the detection of sepsis is lacking.

Among ICU patients with any suspected infection, Sequential (sepsis-related) Organ Failure Assessment (SOFA) score for the identification of septic patients was recommended by the Sepsis-3 Task Force. For outside ICU, on the other hand Seymour et al. introduced quick Sequential Organ Failure Assessment (qSOFA) score for rapid identification of patients with suspected infection The Sequential Organ Failure Assessment SOFA score calculates the severity of dysfunction in six organ systems (Pulmonary, coagulation hepatobiliary, cardiovascular, renal, and neurologic) and also the number of systems involved.

The qSOFA score is a simple score consisting of three items: respiratory rate (RR) ≥ 22 breaths per minute, altered mentation (Glasgow Coma Scale [GCS] < 15), and systolic blood pressure (SBP) < 100mmHg. A qSOFA score ≥ 2 was found to be a predictor of increased all-cause mortality in patients outside ICU.

Therefore the authors of the Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3) recommend the use of a sofa score which enables rapid risk stratification of septic patients requiring prolonged ICU stay along with in-hospital death. Patients having high qSOFA scores need further assessment by the SOFA score. The surviving sepsis campaign has suggested the qSOFA score be used for prognostication purposes only. Further implementation of this within existing guidelines for sepsis is yet to be seen.

Therefore, the aim of our study was to compare the predictive power of qSOFA and SOFAscore, for the prediction of mortality among critically ill in the setting of ICU in tertiary care hospitals.

AIMS AND OBJECTIVES:
AIM: To compare the performance of the SOFA score and qSOFA scores for in-hospital mortality prediction among critically ill patients in an ICU setting in a tertiary care center
OBJECTIVES:
1. PRIMARY OBJECTIVE: To validate Q-SOFA for predicting In-hospital mortality in patients presenting with sepsis in an ICU setting and comparing it to SOFA (Sequential organ failure assessment) score.
2. SECONDARY OBJECTIVE: To validate Q-SOFA for predicting 28 days of mortality in patients presenting with sepsis in an ICU setting in comparison to SOFAscore

Period Of Study: 1.5 Years
Number Of Cases: 50
Design Of The Study: Crossectional study

Inclusion Criteria:

Participants >18yrs age Participants able to provide written informed consent

Suspected infection or proven sepsis to emergency medicine or ward within the span of 24 hours of admission.

Exclusion Criteria:

Any patient with an alternative diagnosis was excluded during analysis.

Exclusion criteria: Age below 18yrs, Congestive cardiac failure with cardiogenic shock.

METHOD OF COLLECTION OF DATA:

All patients at inclusion were subjected through a detailed questionnaire including all patient characteristics and clinical features. Key clinical parameters were followed up during the hospital stay. Q-SOFA and SOFA score was calculated at admission. Patients were followed up to 28days to assess mortality. All the data that is obtained was analyzed with the help of a statistician to validate the Q- SOFA in predicting mortality in patients presenting with suspected or proven sepsis

RESULTS:

A total of 50 cases of were studied.

Baseline Characteristics: A total of 50 patients were in the study and the mean of the age of the population was 54yrs and the study included 56% men and 44% women. The presentation was 8.14 days and also there was a major portion of population with comorbidities like diabetes mellitus about 78%. The following table provides the baseline characteristics of the study population.

TABLE: BASELINE CHARACTERISTICS

Character	N=50	Percentage
Age	54.7(Years)	14.1 (Sd)
Male	28	56%
Female	22	44%
Hypertension	37	74%
Diabetes	39	78%
Ckd	3	6%
Copd	3	6%
Cld	1	2%
Smoking	31	62%
Alcohol	22	44%
Time To Presentation	8.14(Days)	1.74(Sd)
Immuno compromised	2	4%

Demographic Distribution:-

In this study, gender distribution revealed almost the equal predominance of male and female populations except for 57-70 age group where males predominated.
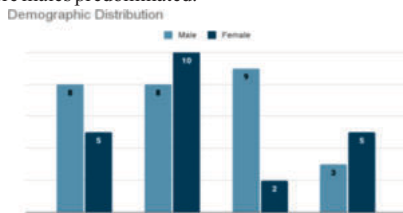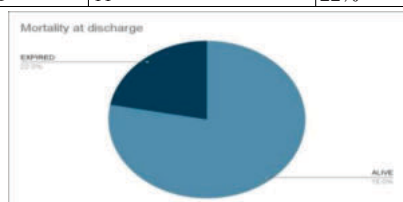

FIGURE

OUTCOME IN PATIENTS WITH SEPSIS:-

1. AT DISCHARGE:-

At discharge overall mortality was 22% i.e, out of 50 patients included in the study 39 were alive and 11 expired.

TABLE

| OUTCOME	FREQUENCY	PERCENTAGE
ALIVE	39	78%
EXPIRED	11	22%

FIGURE

4. AT 28 DAYS POST DISCHARGE:-

Post-discharge 39 patients were followed up till 28 days and on analysis was found that there was a mortality rate of 23.07% at 28 days following discharge i.e., out of 39 patients 30 were alive and 9 expired at follow-up.

TABLE

OUTCOME	FREQUENCY	PERCENTAGE
ALIVE	30	76.92%
EXPIRED	9	23.07%
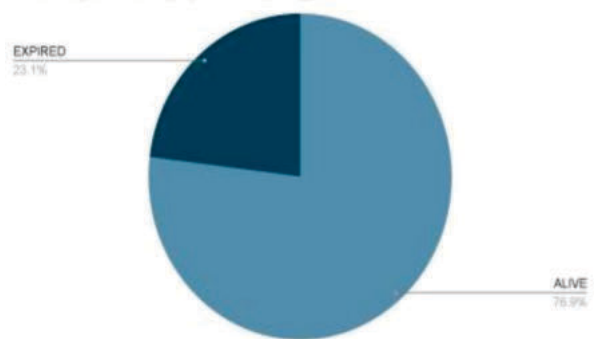
FIGURE

Clinical Profile Of Patients:- Patients included in the study presented with varied symptoms. Fever (96%) and breathing difficulty (64%) was the commonest symptom. A significant number of patients in our population had altered sensorium at presentation. The following table depicts the clinical profile of the patients included in the study.

TABLE

Clinical Feature	No Of Patients N = 50	Percentage
Fever	48	96%
Cough	23	46%
Dyspnoea	32	64%
Hemoptysis	3	6%
Abdominal Pain	28	56%
GCS (Mean)	10.2	2.71(Sd)
Meningitis	3	6%
Altered Sensorium	32	64%
Seizures	2	4%

Laboratory Findings:- In our study laboratory parameters of the included patients were also analyzed. It showed a mean total WBC count of 18104 mm^3 and neutrophil predominance of 85.71%. Also, the mean Procalcitonin of 50 patients was 22.5 and CRP was 66.39. The following table depicts the laboratory parameters of our study patients:-

TABLE

Investigation	Mean (N=50)	Standard Deviation
Hemoglobin (Mg%)	11.50	1.57
Total Count	18104	4936.68
Neutrophil%	85.71%	4.25%
Platelet Count	177	89.58
Creatinine	3.41	1.25
Lactate	3.47	0.89
Ph(Abg)	7.25	0.10
Procalcitonin	22.50	8.11
Crp(Mg/Dl)	66.39	29.36

Scoring System Vs Mortality At Discharge

In our study scoring systems like Q-SOFA and SOFA were analyzed to look at predictive power for mortality.

1. SOFA SCORE VS MORTALITY AT DISCHARGE

Sofa score ranges from 0 to 24 and during the analysis of the study the calculated median was 11. Based on which 2 groups were made.

TABLE : Sofa Score Vs Mortality At Discharge

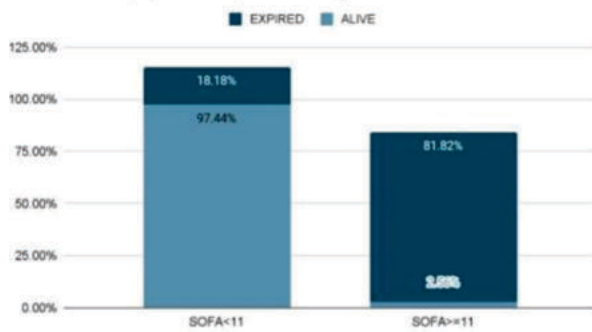|	ALIVE	EXPIRED	TOTAL
SOFA SCORE<11	38 (97.44%)	2 (18.18%)	40 (80%)
SOFA SCORE>=11	1 (2.56%)	9 (81.82%)	10 (20%)
TOTAL	39	11	50

FIG : Sofa Score Vs Mortality At Discharge

2. qSOFA SCORE VS MORTALITY AT DISCHARGE
The Q sofa score of patients was calculated and they were divided into two groups, where one group had a score of less than 2 and the other had more than or equal to two.

Q-Sofa Score Vs Mortality At Discharge:-
TABLE: q-Sofa Score Vs Mortality At Discharge

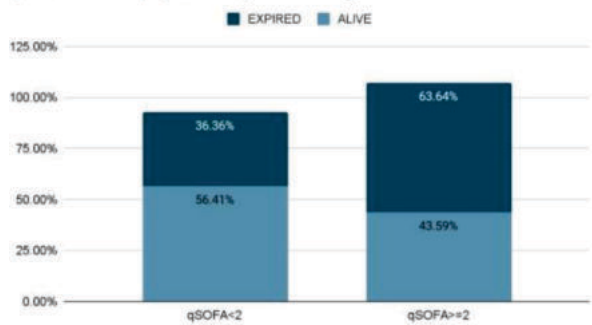|	ALIVE	DEAD	TOTAL
Q-SOFA<2	22 (56.41%)	4 (36.36%)	26 (52%)
Q-SOFA>=2	17(43.59%)	7 (63.64%)	24 (48%)
TOTAL	39	11	50

FIG : Q- Sofa Score Vs Mortality At Discharge

After analysis it was found that 63.64% of patients who expired at discharge had a q-SOFA score of more than 2.

SCORING SYSTEM VS MORTALITY AT 28 DAYS POST DISCHARGE

1) Sofa Score Vs Mortality At 28 Days Post Discharge:-
TABLE: Sofa Score Vs Mortality At 28 Days Post Discharge

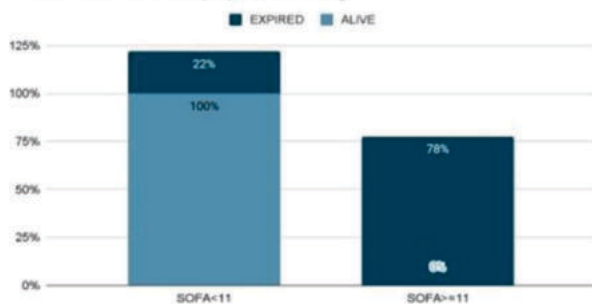|	ALIVE	EXPIRED	TOTAL
SOFA<11	30 (100%)	2 (22.22%)	32 (82.05%)
SOFA>=11	0 (0%)	7(77.78%)	7(17.95%)
TOTAL	30	9	39

FIG : Sofa Score Vs Mortality At 28 Days Post Discharge

On comparing SOFA score in predicting mortality at 28 days, our analysis shows increased mortality with SOFA score more than 11 during admission 8 patients out of 16 expired within 28 days post-discharge had SOFA score more than 11

Q-Sofa Score Vs Mortality At 28 Days Post Discharge:-
TABLE: Q-Sofa Score Vs Mortality At Discharge

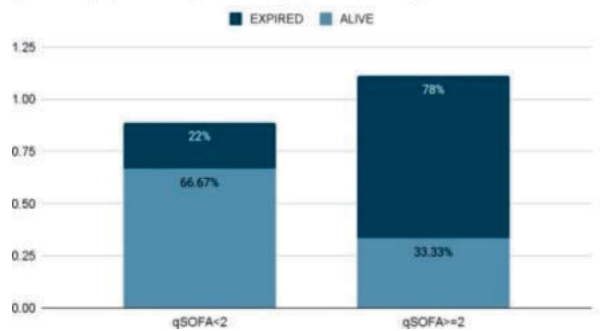|	ALIVE	DEAD	TOTAL
QSOFA<2	20(66.67%)	2(22.22%)	22 (56.41%)
QSOFA>=2	10(33.33%)	7(77.78%)	17 (43.59%)
TOTAL	30	9	39

FIG: Q- Sofa Score Vs Mortality At 28 Days Post Discharge

SENSITIVITY AND SPECIFICITY OF SCORING SYSTEMS AT DISCHARGE

A) SOFA Score - Prevalence Of Mortality At Discharge With Sofa >=11
TABLE

		95% confidence interval	
PREVALENCE	22%	11.5%	36%
SENSITIVITY	81.8%	48.2%	97.7%
SPECIFICITY	97.4%	86.5%	99.9%
ROC	85.40%	68.40%	100%

B) Q-SOFA Score:Prevalence Of Mortality At Discharge With q-Sofa >=2
TABLE

		95% Confidence Interval	
PREVALENCE	22%	11.5%	36%
SENSITIVITY	63.6%	30.8%	89.1%
SPECIFICITY	56.4%	39.6%	72.2%
ROC	71.30%	51.30%	91.4%

AT 28 DAYS POST DISCHARGE

A) SOFA Score: Prevalence Of Mortality at 28 days post Discharge, Sofa >=11
TABLE

		95% CONFIDENCE INTERVAL	
PREVALENCE	23.1%	11.1%	39.33%
SENSITIVITY	77.78%	39.9%	97.2%
SPECIFICITY	100%	88.4%	100%
ROC	95%	86.70%	100%

B. Q-SOFA Score - Prevalence of Mortality At 28 days post Discharge, q-Sofa >=2
TABLE

		95% CONFIDENCE INTERVAL	
PREVALENCE	23.1%	11.1%	39.3%
SENSITIVITY	77.8%	39.9%	97.2%
SPECIFICITY	66.7%	47.2%	82.7%
ROC	73.3%	55.5%	91.1%

COMPARING QSOFA, SOFA VS MORTALITY
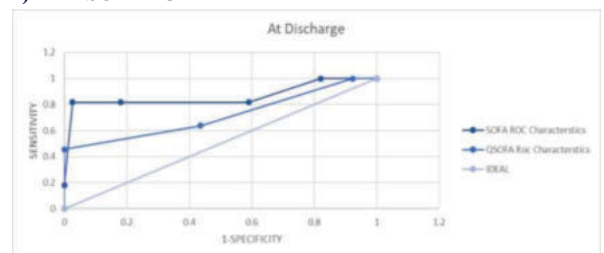### 1) AT DISCHARGE

FIG: ROC curve of SOFA (vs) q-SOFA mortality using sensitivity and specificity at discharge
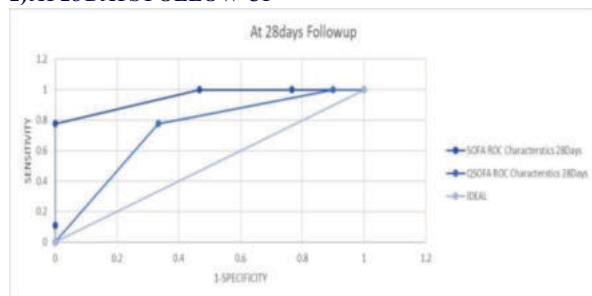
2) AT 28 DAYS FOLLOW-UP

FIG 12:ROC curve of SOFA (vs) q-SOFA mortality using sensitivity and specificity at 28 days post discharge

DISCUSSION

This prospective cohort study was designed to look at the predictive power of mortality in sepsis by different scoring systems and to determine whether the Q-SOFA score predicts mortality better when compared to SOFA in a clinical setting of sepsis. The Q-SOFA is an attractive tool as it does not need any lab investigations to be included, can be administered at the bedside.

Therefore, if accurately predictive of mortality, it is a useful tool to guide therapy, direct treatment goals, and explain prognosis to patients and to their beloved families. The mortality of the study population was 22% and 23.07% at discharge and at 28 days follow-up. This is actually less when compared to the previous prospective sepsis studies done in India where mortality rates of 51.6% and 63.6% (3) (4) were probably due to excellent intensive care.

SCORING SYSTEM IN PREDICTING MORTALITY IN SEPSIS

In our study 2 scoring systems were used –QSOFA and SOFA –both of which are acceptable scoring systems in sepsis. Each of these scores was analyzed with mortality to determine which test predicted mortality better at discharge and at 28 days post-discharge follow-up.

On comparing the SOFA score with mortality it was found that 81.82% of the patients who expired at discharge and 77.78 % of the patients who expired at 28 days post-discharge had a SOFA score more than 11(the median SOFA score). At discharge, the sensitivity along with the specificity of SOFA score was 81.8% and 97.4% respectively and at 28 days follow-up, the sensitivity, and specificity in predicting mortality were 77.78% and 100% respectively.On comparing Q-SOFA score with mortality it was found that 63.64% of the patients who expired at discharge and 77.78% of the patients who expired at 28 days post-discharge had a Q-SOFA score of more than 2. At discharge, the calculated sensitivity, as well as specificity of the Q-SOFA score, was 63.6% and 56.4% respectively and at 28 days post-discharge it was 77.78% and 66.7% respectively.

AUROC was also calculated for the above-mentioned scoring systems in denoting its predictive power for mortality in sepsis patients. At both discharge and 28 days post-discharge follow-up, SOFA score was found better in predicting mortality followed by Q-SOFA score.

Given that both SOFA and Q- SOFA have sensitivities close to each other for both In-hospital and 28-day mortality (81.8% vs. 63.6%) and (77.78% vs. 77.78%), the Q-SOFA could be used for rapid assessment before lab investigations are available for early goal-directed therapy, though SOFA is the most accurate score for predicting mortality.

CONCLUSION
1. Sepsis scoring system Q-SOFA showed a sensitivity of 63.6 % at discharge and 70% at 28 days follow-up for predicting mortality in patients presenting with sepsis
2. Comparison of SOFA, Q-SOFA it was revealed that SOFA score predicted the mortality of sepsis the best both at discharge and at 28 days follow-up
3. On comparing the SOFA score with mortality it was found that 81.82% of the patients who expired at discharge and 77.78 % of the patients who expired at 28 days post-discharge had a SOFA score more than 11

Q-SOFA could be used for rapid assessment before lab investigations are available for early goal-directed therapy, though SOFA is the most accurate score for predicting mortality.

REFERENCES
1. Gül F, Arslantaş MK, Cinel İ, Kumar A. Changing Definitions of Sepsis. Turk J Anaesthesiol Reanim. 2017 Jun;45(3):129–38.
2. Funk DJ, Parrillo JE, Kumar A. Sepsis and Septic Shock: A History. Critical Care Clinics. 2009 Jan 1;25(1):83–101.
3. Paary TTS, Kalaiselvan MS, Renuka MK, Arunkumar AS. Clinical profile and outcome of patients with severe sepsis treated in an intensive care unit in India. Ceylon Medical Journal. 2016 Dec 27;61(4):181.
4. Chatterjee S, Bhattacharya M, Todi SK. Epidemiology of Adultpopulation Sepsis in India: A Single Center 5 Year Experience. Indian J Crit Care Med. 2017 Sep;21(9):573–7.
5. Definitions for Sepsis and Organ Failure and Guidelines for the Use of Innovative Therapies in Sepsis | Elsevier Enhanced Reader [Internet]. [cited 2019 Jul 19].
6. for the International Sepsis Definitions Conference, Levy MM, Fink MP, Marshall JC, Abraham E, Angus D, et al. 2001 SCCM/ESICM/ACCP/ATS/SIS International Sepsis Definitions Conference. Intensive Care Medicine. 2003 Apr;29(4):530–8.
7. Pinson R. Sepsis is still confusing [Internet]. [cited 2019 Jul 23]. Available from: https://acphospitalist.org/archives/2016/02/coding-sepsisconfusing-part-1.htm
8. Singer M, Deutschman CS, Seymour CW, Shankar-Hari M, Annane D, Bauer M, et al. The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). JAMA. 2016 Feb 23;315(8):801.
9. Angus DC, van der Poll T. Severe Sepsis and Septic Shock. New England Journal of Medicine. 2013 Aug 29;369(9):840–51.
10. Churpek MM, Zadravecz FJ, Winslow C, Howell MD, Edelson DP. Incidence and Prognostic Value of the Systemic Inflammatory Response